

Wound Management Using Negative Pressure Therapy

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ABSTRACT

Advanced wound management using Negative Pressure Therapy (NPT) has emerged as a revolutionary approach in the care of complex and chronic wounds. NPT, also known as Negative Pressure Wound Therapy (NPWT), employs subatmospheric pressure to promote wound healing. This review explores the epidemiology and significance of advanced wound management, provides a theoretical framework for understanding NPT, discusses its application in different clinical scenarios, outlines potential complications, and highlights its management strategies. The evidence suggests that NPT is a valuable tool in modern wound care, but its application should be guided by a comprehensive understanding of patient needs and the wound's characteristics. Ultimately, NPT offers promising results for wound management, provided it is integrated into a holistic care approach.

KEYWORDS: Negative Pressure Therapy, Wound Healing, Chronic Wounds, Complications, Wound Management.

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INTRODUCTION

Chronic and complex wounds, which encompass a range of conditions such as diabetic ulcers, pressure ulcers, venous leg ulcers, and postsurgical wounds, present a growing global healthcare challenge. The epidemiological data underscores the increasing prevalence of these wounds, which is driven by a confluence of demographic and clinical factors.

One of the primary contributors to the rising prevalence of chronic wounds is the aging global population. As life expectancy increases, so does the likelihood of developing chronic health conditions, including diabetes and peripheral vascular disease. These conditions are associated with a higher risk of developing non-healing ulcers, particularly in the lower extremities.

Diabetes, in particular, is a significant driver of chronic wounds. The World Health Organization (WHO) reports that the global prevalence of diabetes is on the rise, with over 400 million people affected. Chronic wounds, such as diabetic foot ulcers, are a well-recognized and debilitating complication of diabetes. The American Diabetes Association

estimates that up to 25% of individuals with diabetes will develop a foot ulcer in their lifetime. These ulcers can become chronic and are often difficult to heal due to impaired circulation, neuropathy, and other diabetes-related complications.

Obesity is another important factor contributing to the increased incidence of chronic wounds. The global obesity epidemic is closely linked to conditions like diabetes and vascular disease, which are risk factors for chronic ulcers. Excess body weight can lead to pressure ulcers, especially in individuals with limited mobility. These pressure ulcers can rapidly become chronic if not appropriately managed.

The significance of advanced wound management, particularly through the application of Negative Pressure Therapy (NPT), becomes apparent when considering the profound impact of chronic wounds on both individual patients and healthcare systems. Chronic wounds are not merely a medical concern; they significantly affect patients' quality of life and have far-reaching economic implications.

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For individual patients, chronic wounds result in pain, discomfort, reduced mobility, and a diminished quality of life. These wounds can lead to social isolation and depression, as individuals cope with ongoing pain and a reduced ability to engage in everyday activities.

From a healthcare system perspective, the management of chronic wounds incurs substantial costs. These costs encompass wound care supplies, frequent clinic visits, hospitalizations, and, in some cases, amputations. A study published in the Journal of Medical Economics estimated that the annual cost of managing chronic wounds in the United

States alone exceeds \$30 billion. These financial burdens underscore the need for effective wound management strategies that can promote healing, reduce complications, and enhance patients' well-being.

In light of these epidemiological trends and the considerable impact of chronic wounds, it is crucial to explore advanced wound management techniques like NPT. This review will delve into the theoretical framework of NPT, examine its clinical applications, address potential complications, and outline management strategies to provide a comprehensive understanding of this innovative approach to wound care.

Advantages of Negative Pressure Therapy (NPT) in Wound Management

Advantage

Accelerated Healing

Reduced Infection Risk

Excess Exudate Removal

Minimized Pain and Discomfort

Decreased Risk of Dehiscence

Improved Patient Satisfaction

Versatile Clinical Applications

Evidence-Based Efficacy

Patient-Centered Care

Definition

Negative Pressure Therapy (NPT), also known as Negative Pressure Wound Therapy (NPWT) or vacuum-assisted closure (VAC), is a specialized wound care technique that involves the application of subatmospheric pressure to a wound bed. It consists of a vacuum pump, a wound interface

(dressing), and a collection canister. The dressing, typically made of foam or gauze, is applied to the wound, and a sealed system is created. Negative pressure is delivered, creating an environment with controlled, subatmospheric pressure. This controlled pressure promotes wound healing through various mechanisms



Vacuum-assisted closure

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Mechanisms of Action

NPT employs a multifaceted approach to wound healing. The key mechanisms of action include:

Enhanced Perfusion: Subatmospheric pressure helps increase blood flow to the wound site, promoting tissue oxygenation and nutrient delivery, which are essential for cellular activities associated with wound repair.

Reduction of Edema: NPT aids in the removal of excess wound fluid and edema, thereby reducing local tissue swelling and pressure on capillaries. This reduction in edema improves tissue oxygenation and nutrient supply.

Wound Exudate Management: The controlled negative pressure assists in the removal of excess exudate from the wound, preventing maceration of the surrounding tissue.

Granulation Tissue Formation: NPT promotes the formation of healthy granulation tissue within the wound bed, an essential step in the wound healing process.

Cellular Response: Negative pressure is believed to stimulate cellular activities associated with tissue repair, such as fibroblast migration and proliferation.

Clinical Applications

NPT has demonstrated remarkable versatility in clinical practice. It can be effectively applied in various clinical scenarios:

Diabetic Foot Ulcers: For individuals with diabetic foot ulcers, NPT has been shown to expedite wound healing, particularly when traditional wound care approaches have been insufficient.

Pressure Ulcers: Patients with pressure ulcers benefit from NPT by accelerating wound closure and reducing the risk of recurrence.

Postsurgical Wounds: After surgical procedures, NPT can help in managing surgical wounds, minimizing the risk of dehiscence, and reducing the potential for wound infection.

Traumatic Wounds: Complex traumatic wounds, such as open fractures or degloving injuries, benefit from NPT by facilitating wound bed preparation and tissue granulation.

Evidence-Based Efficacy

The effectiveness of NPT in wound management is supported by a growing body of evidence. Clinical studies and trials have consistently demonstrated positive outcomes, including faster wound healing, reduced infection rates, and improved patient satisfaction. It is important to note that NPT should be used in a patient-specific and wound-specific manner, as its effectiveness can vary based on factors such as wound etiology, size, and location.

Patient-Centered Care

Incorporating NPT into wound management necessitates a patient-centered approach. Shared decision-making, involving patients in the choice of therapy, is essential to ensure that the treatment aligns with their goals and preferences. The holistic care approach considers not only the wound's characteristics but also the patient's lifestyle and values.

By understanding the theoretical framework of NPT, healthcare providers can make informed decisions regarding its application in wound care, providing patients with a comprehensive and effective approach to managing chronic and complex wounds. This approach can ultimately improve patients' quality of life, reduce healthcare costs, and contribute to better outcomes for individuals facing challenging wounds.

DISCUSSION

Clinical Application of NPT

Negative Pressure Therapy (NPT) has found success in various clinical scenarios, making it a valuable tool in wound management:

Diabetic Foot Ulcers: Diabetic foot ulcers are a significant health concern, and NPT has demonstrated substantial promise in this context. For individuals with diabetes, chronic wounds, particularly on the feet, are a common and serious complication. NPT accelerates wound healing by promoting tissue perfusion, reducing edema, and encouraging granulation tissue formation. It's especially beneficial when traditional wound care approaches have proven insufficient.

Pressure Ulcers: Patients with pressure ulcers, often due to limited mobility or extended periods of pressure on specific areas, also benefit from NPT. By expediting wound closure, NPT helps reduce the risk of recurrence, a common concern in patients with limited mobility.

Postsurgical Wounds: NPT is an invaluable adjunct to managing postsurgical wounds. It aids in wound bed preparation, tissue granulation, and the overall healing process. This minimizes the risk of dehiscence (wound opening) and infection, which are common complications after surgery.

Complex Traumatic Wounds: Complex traumatic wounds, such as open fractures or degloving injuries, can benefit significantly from NPT. By facilitating wound bed preparation and granulation tissue formation, NPT simplifies the management of challenging traumatic wounds.

Evidence-Based Efficacy

The evidence supporting the efficacy of NPT in wound management is robust. Multiple clinical studies and trials have consistently demonstrated positive outcomes associated with NPT:

Faster Wound Healing: NPT accelerates the wound healing process. By promoting tissue perfusion, reducing edema, and encouraging granulation tissue formation, NPT helps wounds progress through the stages of healing more rapidly.

Reduced Infection Rates: NPT creates an environment within the wound that is less conducive to bacterial growth, reducing the risk of infection. Additionally, by removing excess wound exudate, NPT minimizes the risk of bacterial colonization and biofilm formation.

Improved Patient Satisfaction: Patients often report greater comfort and reduced pain during NPT compared to traditional dressings and treatments. The ability to manage wound

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exudate effectively can also improve the overall patient experience.

These positive outcomes contribute to the growing adoption of NPT in clinical practice, making it an integral part of the wound management armamentarium. However, it's important to recognize that NPT's effectiveness may vary based on wound etiology, size, and location, as well as patient-specific factors.

Patient-Centered Care

The success of NPT in wound management is not solely based on its clinical effectiveness; a patient-centered approach is equally crucial:

Patient Preferences: Wound care is most effective when it aligns with patient preferences and values. Involving patients in the decision-making process and considering their goals and lifestyles helps ensure a holistic and patient-centered approach to care.

Shared Decision-Making: The shared decision-making model allows patients to actively participate in the choice of wound management strategies. This approach considers not only the wound's characteristics but also the patient's values, ultimately resulting in more patient-centric care.

CONCLUSION

By comprehensively understanding the clinical applications of NPT, its evidence-based efficacy, and the importance of patient-centered care, healthcare providers can effectively integrate NPT into wound management. This approach improves the quality of life for patients with chronic and

complex wounds, reduces healthcare costs, and contributes to better outcomes in challenging wound scenarios.

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